OPERATING INSTRUCTIONS

MODEL TTS 25A
TRANSMISSION MEASURING AND DC CURRENT
MEASURING SET

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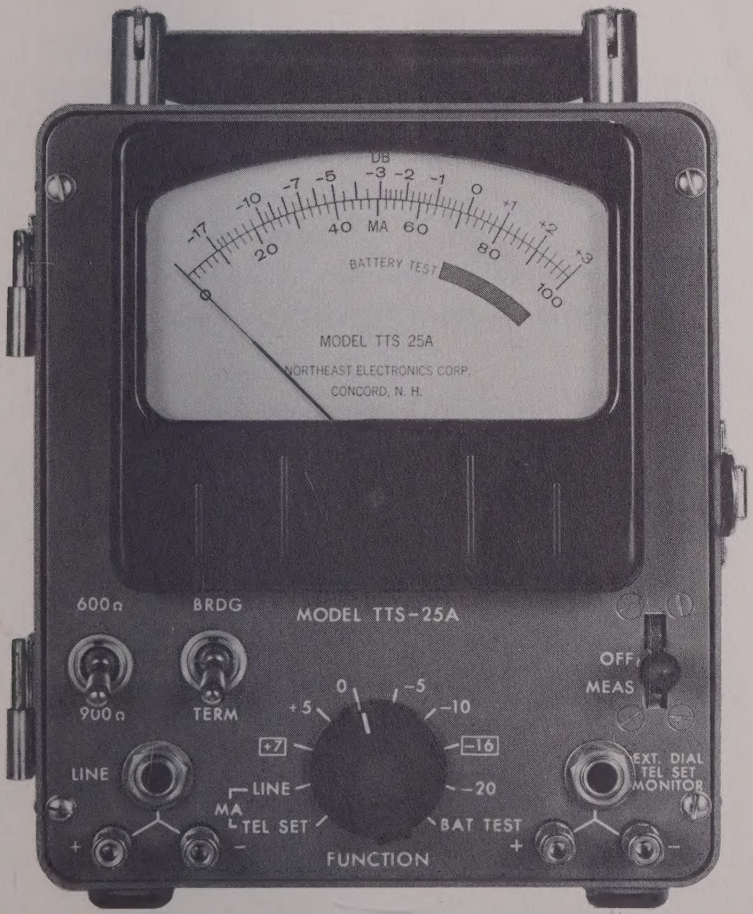

DB
-17
-10
-7
-5
-3
-2
-1
0
+1
+2
+3
20
40
MA
60
80
100
BATTERY TEST
MODEL TTS 25A
NORTHEAST ELECTRONICS CORP.
CONCORD, N. H.
600Ω
900Ω
BRDG
TERM
MODEL TTS-25A
OFF
MEAS
+5
0
-5
-10
+7
-16
-20
LINE
MA
LINE
TEL SET
BAT TEST
FUNCTION
EXT. DIAL
TEL SET
MONITOR

FIG-1

MODEL TTS 25A

TRANSMISSION MEASURING AND DC CURRENT MEASURING SET

OPERATING INSTRUCTIONS

1.0 GENERAL

1.01 The Model TTS 25A is a compact, combined transmission measuring and DC current measuring set. The set is particularly useful for station testing and loop checking when used in conjunction with the Model TTS 39 Reference Tone Generator equipped with a Model TTS 39XF Frequency Cycling Adapter.

1.02 Two models are provided, one with a 600 and 900 ohm receive impedance and the other with a 600 and 1200 ohm impedance. This manual covers both models.

1.03 The following ranges of measurements may be made:

a. Level measurements from +10 to -37 dbm in seven ranges.

b. DC current from 0 to 100 ma.

1.04 Level measurements may be made on 600 and 900 (or 1200) ohm circuits on either a terminated basis or a 20,000 ohm bridging basis. The frequency response is within ±0.1 db from 200 cps to 20 KC, and ±1.0 db from 100 cps to 75 KC. The resistors used for the 600 and 900 (or 1200) ohm terminations are also used to provide a DC path to hold the line under test. AC coupling is provided to the input amplifier of the set to prevent any damage from DC voltages on the line, up to 400 volts.

1.05 Two jacks, each in parallel with two metal binding posts, are provided for making connections to the set.

1.06 The TTS 25A is powered by two internal 9 volt batteries.

1.07 The unit is contained in a grey finished aluminum case 6" w x 7" h x 5 1/8" d. The weight of the unit is 3 3/4 pounds. Storage for cords is provided in the cover. Closing the cover will move the MEASURE key switch to the OFF position to prevent unnecessary battery drain.

1.08 The face view of the unit is shown in Figure 1, the overall schematic in Figure 2.

2.0 PERFORMANCE DATA

Meter

2.01 A 4 1/2", 1 ma meter with the following scales is provided:

DB Scale: 0.2 db divisions from +3 to -3 db
0.5 db divisions from -3 to -10 db
1.0 db divisions from -10 to -17 db

MA Scale: 2 ma divisions from 0 to 100 ma

BATT TEST Scale: A green arc

The meter can withstand a continuous 50% overload (150 ma).

Level Measuring

2.02 The level measuring performance and features are:

Range of Measurements: +10 dbm to -37 dbm.

Frequency Response: Maximum variations from 1000 cps response, 70°F and +3 to -3 db reading on meter.

±0.1 db from 200 cps to 30 KC
±.25 db from 150 cps to 50 KC
±1.0 db from 100 cps to 75 KC

Calibration: An internal calibration control is provided to set the meter at 0 db when an accurate 0 dbm signal is applied to the LINE jack.

Stability of Calibration: Changes referred to measurements at 70°F on representative set.

Temperature Errors: Typical performance at 0 db on meter, 50 to 120°F, ±0.1 db, 30 to 120°F, ±.25 db.

Supply Voltage Errors: Typical performance at 0 db on meter, ±0.1 db change from 18 volts to 12 volts.

Accuracy: ±0.1 db from +3 to -3 db on meter

Attenuator Accuracy: Any position ±.1 db

Input Impedance:

Terminated: 600 ohms ±5% and 900 (or 1200) ohms ±5% at 1000 cps

Bridging: 20,000 ohms for 600 and 900 (or 1200) ohms bridging.

DC Blocking: AC coupling is provided to the input amplifier to prevent damage from DC voltages up to 400 vdc.

Holding Circuits: The resistors used for 600 and 900 (or 1200) ohm terminations provide a DC path to hold the line under test.

Receive on LINE Jack: A signal received on the LINE jack can be monitored on the EXT jack without affecting the accuracy of the readings.

Current Measuring

2.03 The current measuring performance and features are:

Range of Measurements: 0 to 100 ma

Impedance: 10 ohms across terminals in the LINE MA position of FUNCTION switch. 10 ohms in series with the circuit connected to the EXT TEL SET terminals when the FUNCTION switch is in the TEL SET MA position.

Accuracy: ±2% of full scale.

3.0 CIRCUIT DESCRIPTION

3.01 The Model TTS 25A Transmission Test Set contains a transistorized amplifier designed to drive the meter for all level measurements. In addition it provides through connection from the LINE jack to the TEL SET jack. The front panel view of the set is shown in Figure 1.

Level Measuring Circuit

3.02 In all level measuring positions of the FUNCTION switch the LINE jack is connected to a voltage divider attenuator, the output of which is connected to the input of the transistor amplifier. This circuit arrangement is shown in the overall schematic, Figure 2.

3.03 The amplifier is a conventional transistor amplifier in which the rectifier bridge supplying the meter is inserted in the feedback path. Specially selected components as well as the use of negative feedback provide gain stability with variations in temperature and battery voltage.

3.04 The amplifier has sufficient gain to provide a 0 dbm meter reading with an input signal of -20 dbm. The meter scale is calibrated from +3 to -17 db. As a result, levels of -37 dbm can be read in the most sensitive position of the attenuator.

3.05 A 600 and 900 (or 1200) ohm impedance switch is provided to enable direct reading on either 600 and 900 (or 1200) ohm circuits, and a BRDG/TERM switch is provided to enable either bridging measurements or terminated measurements. The BRDG/TERM switch, when in the TERM position, provides a DC holding circuit through the 600 or 900 (or 1200) ohm resistor. No holding circuit is provided when the set is used for bridging measurements.

DC Current Measuring Circuits

LINE MA

3.06 When the FUNCTION switch is in the LINE MA position, a 10 ohm current measuring circuit is connected across the tip and ring of the line circuit, thereby indicating short circuit line current.

TEL SET MA

3.07 The FUNCTION switch, when in the TEL SET MA position, connects the LINE jack through to the TEL SET jack and connects a 10 ohm current measuring circuit in series with the telephone set. The total circuit current through the telephone set can then be read directly on the TTS 25A meter.

BATT TEST

3.08 A BATT TEST position is provided on the FUNCTION switch which transfers the meter from its normal measuring circuit to a circuit for measuring the internal battery voltage.

4.0 CONTROLS, SWITCHES, JACKS, AND TERMINALS

4.01 FUNCTION Switch

The FUNCTION switch allows selection of the various functions performed by the TTS 25A.

4.02 MEAS Key Switch

The MEAS key switch, when in the MEAS position, prepares the set for measurement of external signals, and disconnects the internal batteries when in the OFF position.

4.03 600/900 (or 600/1200) OHM Impedance Switch

The impedance switch matches the internal level measuring circuits to either a 600 or 900 (or 1200) ohm circuit under test.

4.04 BRDG/TERM Switch

The BRDG/TERM switch prepares the level measuring circuits for either bridging or terminating measurements.

4.05 LINE Jack and Terminals

The LINE jack provides for connection of the line circuit to the TTS 25A for measurements of level and DC current. The terminals are tied in parallel with the tip and ring of the jack.

4.06 EXT DIAL/TEL SET/MONITOR Jack and Terminals

This jack provides for connection of external station equipment to the TTS 25A for purposes of dialing through the test set and measuring tel set current. This jack also provides a monitoring feature while measuring level on the line.

5.0 CALIBRATION

Level Measuring Circuits Calibration

5.01 The TTS 25A level measuring circuits are accurately calibrated at the factory and the internal calibrate control is sealed to prevent it from changing due to vibration of handling and shipping. It may be necessary to recheck calibration periodically, depending on conditions of use, against an accurately calibrated 1 KC, 0 dbm signal standard.

5.02 To calibrate the level measuring circuits, proceed as follows:

5.03 Move the FUNCTION switch to the BATT TEST position and insure that the batteries are in satisfactory condition. If the batteries are not satisfactory, replace all batteries.

5.04 Move the FUNCTION switch to the 0 dbm position, move the MEAS switch to MEAS, move the TERM/BRDG switch to TERM, and move the 600/900 (or 600/1200) ohm impedance switch to the proper position to match the impedance of the standard signal generator.

5.05 Connect the output of the signal generator to the LINE jack and observe the meter reading on the TTS 25A. If the meter does not read 0 dbm, remove the TTS 25A from its case and readjust R106 until the meter does read 0 dbm. The control should then be resealed with glyptol and the set reinstalled in its case.

6.0 OPERATION

6.01 Initial Steps

a. Unlatch and open the cover. The cover can be detached from the case by sliding the cover up toward the handle end of the case. When measurements are completed, it is recommended that the cover be attached and closed, as a bracket on the cover will insure that the MEAS key switch is in the OFF position when the cover is closed.

b. Connect the line to the LINE jack or binding posts, connect a telephone set to the EXT TEL SET jack or binding posts.

6.02 To Make Level Measurements

a. Place the FUNCTION switch in the +7 dbm position, select the proper impedance to match the line, and move the BRDG/TERM switch to the desired position.

b. Use the dial of the telephone set connected to the EXT TEL SET jack to dial the number of the central office milliwatt generator.

c. After the connection has been established, move the MEAS key switch to the MEAS position.

d. Move the FUNCTION switch to a position which provides a reading between +3 and -3 on the meter. The measured level is the algebraic sum of the meter reading and the designated position of the FUNCTION switch.

6.03 To Measure TEL SET or LINE Current

a. Move the FUNCTION switch to the TEL SET MA position and move the MEAS key switch to the MEAS position. If the meter reading is reversed, reverse the leads connected to the LINE terminals. The current flowing through the telephone set can now be read directly on the black MA scale.

b. Move the FUNCTION switch to the LINE MA position and place the MEAS key switch in the MEAS position. The short circuit line current can be read directly on the meter. (The impedance of the current measuring circuit is 10 ohms.)

7.0 MAINTENANCE

7.01 No routine maintenance is necessary on the TTS 25A except a periodic check of the condition of the batteries, and an occasional check of the level measuring calibration with a 1 KC, 0 dbm signal standard, as described in Section 5.0.

7.02 To check the internal batteries, move the MEAS key switch to MEAS, and move the FUNCTION switch to the BATT TEST position. The batteries should be replaced when the meter reads below the green battery test arc.

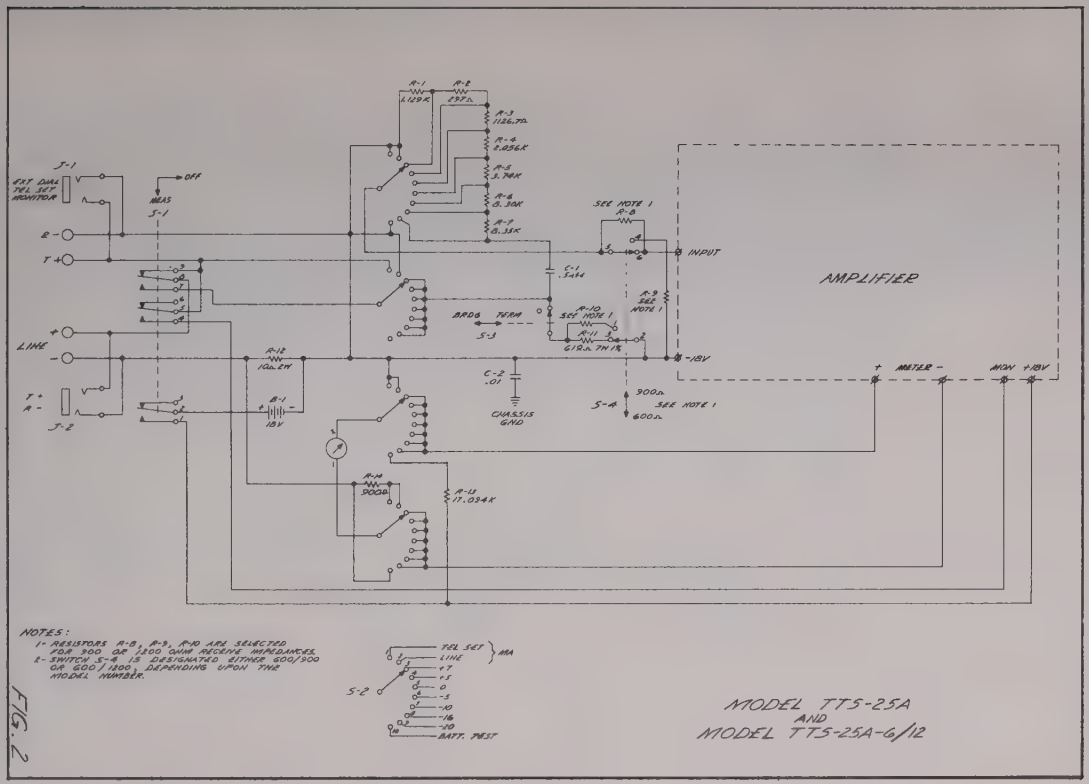
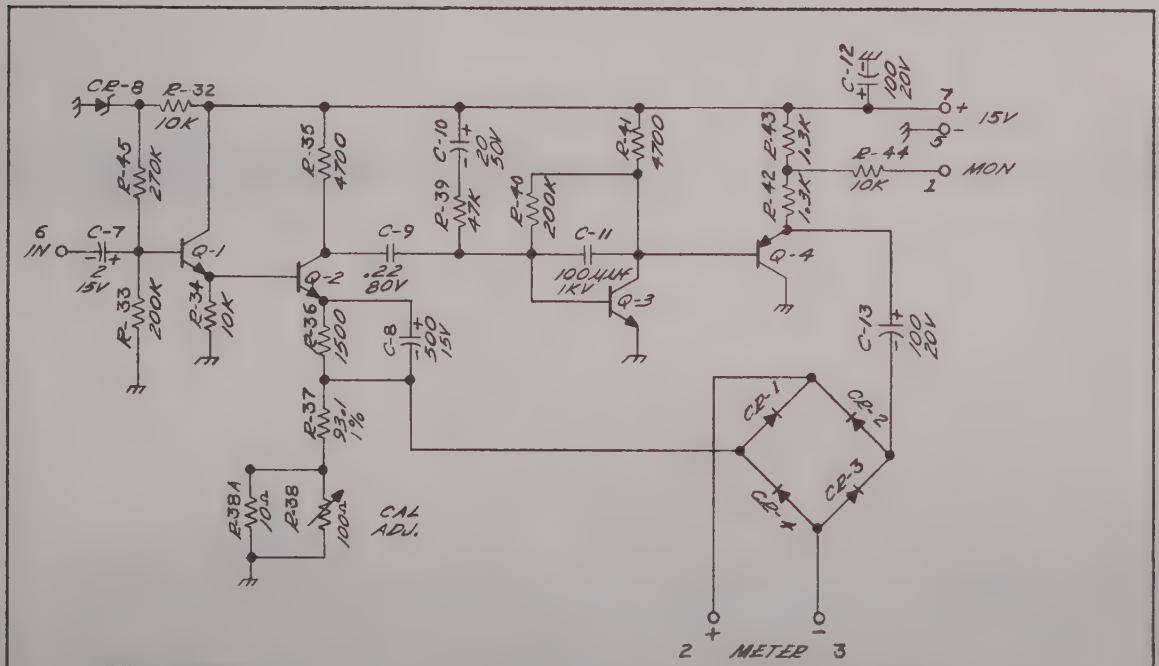

J-1
EXT DIAL TEL SET ARRNTOR
OFF
MEAS
J-1
E -
T +
LINE
+
-
T +
A -
J-2
R-1
1.129K
R-2
237Ω
R-3
1126.7Ω
R-4
3.836K
R-5
1.76K
R-6
9.30K
R-7
8.33K
SEE NOTE 1
R-8
INPUT
AMPLIFIER
C-1
.5μf
R-9
SEE NOTE 1
R-10
SEE NOTE 1
R-11
612Ω 7% 1%
-18V
BRDG TERM
S-3
R-12
10Ω 2W
C-2
.01
CHASSIS GND
S-4
900Ω
600Ω
SEE NOTE 1
R-1
18V
R-14
900Ω
R-13
17.054K
+ METER -
MON +18V
NOTES:
1- RESISTORS R-8, R-9, R-10 ARE SELECTED FOR 900 OR 1200 OHM RECEIVE IMPEDANCES.
2- SWITCH S-4 IS DESIGNATED EITHER 600/900 OR 600/1100 DEPENDING UPON THE MODEL NUMBER.
S-2
TEL SET
LINE
+7
+1
0
-1
-10
-16
-20
BATT. TEST
MA
MODEL TTS-25A
AND
MODEL TTS-25A-6/12

FIG. 2



CR-1 = IN764
CR-2 THRU CR-5 = IN198
Q-1 THRU Q-3 = 2N2102
Q-4 = 2N3638
ALL CAPS IN μF UNLESS NOTED

FIG-3

AMPLIFIER
SCHEMATIC
TTS 25

TABLE OF REPLACEABLE PARTS

Circuit Ref	Description	Mfr* & Mfr's Designation
C1	Capacitor: fixed, paper, .5 mfd, 400 vdc	A, P8292ZN21
C7	Capacitor: fixed, electrolytic, 2 mfd, 15 vdc	O, TE-1149
C8	Capacitor: fixed, electrolytic, 500 mfd, 15 vdc	G, APD-124-0
C9	Capacitor: fixed, paper, .22 mfd, 80 vdc	O, 192P
C10	Capacitor: fixed, electrolytic, 20 mfd 50 vdc	O, TE1305
C11	Capacitor: fixed, ceramic, 100 mmfd, 1000 vdc	D, DD-101
C12	Capacitor: fixed, electrolytic, 100 mfd, 20 vdc	G, APD-095
C13	Capacitor: fixed, electrolytic, 100 mfd, 20 vdc	G, APD-095
R1	Resistor: fixed, metal film, 1.129 K ±1%, ½w	I, CEC-TO
R2	Resistor: fixed, metal film, 297 ohms ±1%, ½ w	I, CEC-TO
R3	Resistor: fixed, metal film, 1.1267 K ±1%, ½ w	I, CEC-TO
R4	Resistor: fixed, metal film, 2.056 K ±1%, ½ w	I, CEC-TO
R5	Resistor: fixed, metal film, 3.740 K ±1%, ½ w	I, CEC-TO
R6	Resistor: fixed, metal film, 8.300 K ±1%, ½ w	I, CEC-TO
R7	Resistor: fixed, metal film, 8.350 K ±1%, ½ w	I, CEC-TO
R8	Resistor: fixed, metal film, selected, ±1%, ½ w	I, CEC-TO
R9	Resistor: fixed, metal film, selected ±1%, ½ w	I, CEC-TO
R10	Resistor: fixed, wirewound, selected, ±1%, 3 w	E, RS2
R11	Resistor: fixed, wirewound, 619 ohms ±1%, 7 w	E, RS7
R12	Resistor: fixed, wirewound, 10 ohms ±1%, 2 w	O, 24OE-1001
R13	Resistor: fixed, composition, selected	B
R14	Resistor: fixed, composition, selected	B
R32	Resistor: fixed, composition, 10 K ±5%, ½ w	B, EB1035
R33	Resistor: fixed, composition, 200 K ±5%, ½ w	B, EB2045
R34	Resistor: fixed, composition, 10 K ±5%, ½ w	B, EB1035
R35	Resistor: fixed, composition, 4.7 K ±5%, ½ w	B, EB4725
R36	Resistor: fixed, composition, 1.5 K ±5%, ½ w	B, EB1525
R37	Resistor: fixed, metal film, 93.1 ohms ±1%, ½ w	I, CEC-TO
R38	Resistor: fixed, variable, 100 ohms	K, MTC-4
R38A	Resistor: fixed, composition, 10 ohms ±10%, ½ w	B, EB1011
R39	Resistor: fixed, composition, 47 K ±10%, ½ w	B, EB4731
R40	Resistor: fixed, composition, 200 K ±5%, ½ w	B, EB2045
R41	Resistor: fixed, composition, 4.7 K ±5%, ½ w	B, EB4725
R42	Resistor: fixed, composition, 1.3 K ±5%, ½ w	B, EB1325
R43	Resistor: fixed, composition, 1.3 K ±5%, ½ w	B, EB1325
R44	Resistor: fixed, composition, 10 K ±5%, ½ w	B, EB1035
R45	Resistor: fixed, composition, 270 K ±5%, ½ w	B, EB2741
CR1	Diode	R, 1N198
CR2	Diode	R, 1N198
CR3	Diode	R, 1N198
CR4	Diode	R, 1N198
CR8	Diode: zener	S, 1N764
Q1	Transistor: NPN	M, 2N2102
Q2	Transistor: NPN	M, 2N2102
Q3	Transistor: NPN	M, 2N2102
Q4	Transistor: PNP	H, 2N3638
J1	Jack: (LINE)	Q, L-12B
J2	Jack: (EXT)	Q, L-12B

TABLE OF REPLACEABLE PARTS

Circuit Ref	Description	Mfr* & Mfr's Designation
S1	Switch: MEAS	P, 170E
S2	Switch: FUNCTION	D, PA1015
S3	Switch: BRDG/TERM	C, 31015BP
S4	Switch: IMPEDANCE	C, 81027CH
B1	Battery: 2 per set	F, 226
	Knob: for S2	J, 648-3L-BB
	Test Leads	N, 20221
	Test Lead Clip	N, 310
	Meter: special	L

*See List of Manufacturers Code Letters for Replaceable Parts Table

LIST OF MANUFACTURERS CODE LETTERS

Code Letter	Manufacturer
A	Aerovox Corporation
B	Allen-Bradley Company
C	Arrow-Hart and Hageman Electric Company
D	Centralab
E	Dale Electronics, Inc.
F	Eveready
G	International Electronic Industries, Inc.
H	Fairchild Semiconductor
I	IRC, Inc.
J	Kurz-Kasch, Inc.
K	P. R. Mallory and Company
L	Northeast Electronics Corporation
M	Radio Corporation of America
N	H. H. Smith Company
O	Sprague Electric Company
P	Stromberg-Carlson
Q	Switchcraft, Inc.
R	Sylvania Electric Products, Inc.
S	Transitron

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